SUGAR BEET FERTILITY TRIALS in ELMORE COUNTY

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INTRODUCTION

Nitrogen management is a vital component of sugar beet crop management in Idaho. Adequate nitrogen is essential for plant growth, but excess nitrogen late in the season may depress sugar content in sugarbeets. Nitrate leaching into groundwater is an environmental problem that may occur when nitrogen is applied in excess of crop use. Thus, it is important to optimize nitrogen applications in terms of quantity and timing. Experiments were conducted by the Elmore County Extension staff, in cooperation with the Amalgamated Sugar Company, to evaluate sugar beet response to nitrogen fertilizer applied at various rates and times.

METHODS

The trials were conducted on sprinkler irrigated fields in Elmore County. Agronomic data for each field are summarized in Table 1. Crop management, other than fertilizer application, followed local grower practices.

1995 Trial

The various fertilizer treatments consisted of 100, 150, and 250 lbs. N/A applied on May 19, 1995 and split applications of 50, 75, 100, and 125 lbs. N/A applied on both May 19 and June 20. Urea was the nitrogen source for all applications. All treatments were topdressed. The field was irrigated within two days of nitrogen application. The plots were arranged in a completely randomized design with four replications.

On October 6, 1995 the plots were harvested and samples were analyzed by the Amalgamated Sugar Company for tare, sugar content, beet nitrate, and beet conductivity.

1996 Trial

The fertilizer treatments consisted of 120, 160, 280, and 400 lbs. N/A applied as urea. Treatments were applied early post-emergence, or split with pre-emergence surface and late post-emergence applications. Petiole samples were collected on June 14, July 8, and

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August 12. The samples were analyzed for nitrate by the Amalgamated Sugar Company. On September 26 the plots were harvested. Plot sections were weighed for yield determination. Samples were taken and analyzed for tare, sugar content, beet nitrate, and beet conductivity by the Amalgamated Sugar Company.

1997 Trial

The fertilizer treatments consisted of 146, 195, 341 and 487 lbs. N/A applied as urea. Treatments were done according to the same scheme of split applications as in 1996. Treatments were arranged in a randomized complete block with four replications. On October 8 the plots were harvested. Beets from plot sections were weighed for yield determination. Samples were taken and analyzed for tare, sugar content, and beet nitrate.

RESULTS AND DISCUSSION

1995 Trial

The split applications of nitrogen at 75 + 75 and 100 lbs. N/A produced a yield of 26.7 T/A. This was significantly higher than the control. All other treatments were not significantly different from the control. The same was true for Sugar T/A. There were no significant differences in sugar percentage, conductivity, or beet nitrate from the control (Table 1).

In comparing split versus single applications, the only significant yield difference was for the 200 lb. rate. The split application produced 26.7 T/A, the single application produced 21.9 T/A. However, there was no significant difference in terms of sugar T/A (Table 1). Regarding application timing, there were no significant differences between application times for sugar T/A or nitrate.

1997 Trial

The highest rate of nitrogen (487 lb. N/A) applied as a 3-way split application produced the highest beet yield (42.5 T/A) and the highest sugar yield (6.3 T/A). This was significantly higher than the same rate applied as PES/EP split, but not significantly different than the other application types. The highest percentage of sugar was 15.3 for the one time rate (195 lb. N/A) applied as a PES/EP split application. This was not significantly different than the other application types for this rate.

Table 1. Agronomic data for 1995, 1996, and 1997 sugarbeet fertility trials.

	1995	1996	1997
Texture	Loam	Sand	SnLo*
Soil NO_3 (ppm), 0-12"	4	5	3
Soil NO_3 (ppm), 12-24"	0	15	3
Soil NH_4 (ppm), 0-12"	3	4	7
Soil NH_4 (ppm), 12-14"	0	4	5
Previous Crop	Wheat	Barley	Wheat

* SnLo = Sandy Loam

Table 2. Effect of nitrogen treatments on yield, sugar content, and sugar beet quality parameters. 1995 trial.

	Rate (lbs. N/A)						
Treatment	May 19	June 20	Yield 1/ (tons/A)	Sugar 1/ (%)	Sugar 1/ (tons/A)	NO_3^- 1/ (ppm)	Conductivity 1/ (mmho/cm)
Control	0	0	21.8 b	17.1 a	3.7 b	137.0 ab	0.56 a
Nitrogen	100	0	23.8 ab	17.4 a	4.1 ab	117.5 ab	0.52 a
Nitrogen	150	0	24.3 ab	17.4 a	4.2 ab	79.0 b	0.47 a
Nitrogen	200	0	21.9 b	17.4 a	4.0 ab	83.2 ab	0.49 a
Nitrogen	250	0	26.3 ab	16.9 a	4.4 ab	150.5 a	0.56 a
Nitrogen	50	50	24.1 ab	17.5 a	4.2 ab	107.7 ab	0.52 a
Nitrogen	75	75	26.7 a	17.3 a	4.6 a	102.7 ab	0.54 a
Nitrogen	100	100	26.7 a	17.5 a	4.7 a	105.2 ab	0.51 a
Nitrogen	125	125	26.4 ab	16.8 a	4.4 ab	116.5 ab	0.51 a

1/ Means followed by the same letter in the same column are not significantly different at the 0.05 level according to the LSD test.

Table 3. Effect of nitrogen treatments on sugar beet quality, parameters, and yield - 1996 trial.

N Rate lb./A)	Application Type 1/ PES	EP	LP	Yield T/A	Sugar %	Sugar T/A	Nitrate (ppm)	Conductivity
120	½	½		37.8 AB	14.7 A	5.5 AB	518.8 B	1.01 AB
120		1		36.3 AB	14.5 A	5.3 AB	635.3 AB	1.01 AB
120		½	½	36.8 AB	14.6 A	5.4 AB	665.8 AB	1.01 AB
120	1/3	1/3	1/3	37.4 AB	14.2 A	5.3 AB	691.5 AB	1.09 AB
160	½	½		34.9 AB	13.2 A	4.6 B	595.4 AB	0.98
160		1		39.4 A	14.4 A	5.7 A	645.6 AB	1.02 AB
160		½	½	37.4 AB	13.5 A	5.0 AB	581.8 AB	1.12 AB
160	1/3	1/3	1/3	33.0 B	14.1 A	4.6 B	854.8 A	1.16 A
280	½	½		34.7 AB	14.3 A	5.0 AB	785.8 AB	1.14 AB
280		1		38.1 AB	14.0 A	5.3 AB	676.0 AB	1.10 AB
280		½	½	36.9 AB	14.2 A	5.3 AB	668.8 AB	1.04 AB
280	1/3	1/3	1/3	36.9 AB	14.3 A	5.3 AB	637.4 AB	0.99 AB
400	½	½		38.4 AB	14.4 A	5.5 AB	636.5 AB	1.05 AB
400		1		37.7 AB	14.3 A	5.4 AB	709.2 AB	1.09 AB
400		½	½	34.9 AB	14.3 A	5.0 AB	666.8 AB	1.09 AB
400	1/3	1/3	1/3	35.6 AB	14.2 A	5.0 AB	748.6 AB	1.09 AB
Check				35.5 AB	13.9 A	4.9 AB	550.4 B	0.97 B

1/ PES = Pre-emergence surface, EP = Early Post-emergence, LP = Late Post-emergence

2/ Means followed by the same letter in the same column are not significantly different at the 0.05 level according to Duncan's Multiple Range Test.

Table 4. Effect of nitrogen treatments on sugar beet quality, parameters, and yield - 1997 trials.

N Rate (lb./A)	Application Type 1/ PES	EP	LP	Yield T/A	Sugar %	Sugar T/A	Nitrate (ppm)	Conductivity
146	½	½		33.9 B	14.8 ABC	5.0 BCD	212.5 ABCD	0.64 ABC
146		1		33.6 B	14.2 BC	4.8 CD	135.5 CDE	0.59 BC
146		½	½	33.3 B	15.0 ABC	5.0 BCD	107.8 DE	0.54 C
146	1/3	1/3	1/3	37.6 AB	14.9 ABC	5.6 ABC	146.2 CDE	0.59 BC
195	½	½		39.4 AB	15.3 A	6.0 AB	205.0 ABCD	0.61 ABC
195		1		36.5 AB	14.5 ABC	5.3 ABC	172.5 BCDE	0.61 ABC
195		½	½	35.4 B	15.0 ABC	5.3 ABC	170.0 BCDE	0.59 BC
195	1/3	1/3	1/3	35.6 B	14.6 ABC	5.2 ABC	133.0 CDE	0.63 ABC
341	½	½		39.7 AB	15.1 AB	6.0 AB	168.6 BCDE	0.63 ABC
341		1		37.2 AB	14.3 ABC	5.3 ABC	211.5 ABCD	0.64 ABC
341		½	½	35.4 B	14.5 ABC	5.1 BC	176.3 ABCDE	0.62 ABC
341	1/3	1/3	1/3	34.9 B	14.4 ABC	5.1 BC	222.7 ABC	0.66 AB
487	½	½		33.7 B	14.1 C	4.7 CD	277.5 AB	0.72 A
487		1		38.9 AB	14.2 BC	5.5 ABC	286.0 A	0.65 ABC
487		½	½	37.3 AB	14.0 C	5.2 ABC	268.3 AB	0.69 AB
487	1/3	1/3	1/3	42.5 A	14.8 ABC	6.3 A	204.7 ABCD	0.63 ABC
Check				26.3 C	15.2 AB	4.0 D	74.0 E	0.54 C

1/ PES = Pre-emergence surface, EP = Early Post-emergence, LP = Late Post-emergence

2/ Means followed by the same letter in the same column are not significantly different at the 0.05 level according to the LSD test.